



الجامعة الزيتونة الأردنية  
Faculty of Pharmacy  
Al-Zaytoonah University of Jordan

" نحو تعليم صيدلاني متميز "  
Toward Excellence in Pharmaceutical  
Education

الجامعة الزيتونة الأردنية  
Al-Zaytoonah University of Jordan  
كلية الصيدلة  
Faculty of Pharmacy



" Tradition and Quality "

Detailed Course Description - Course Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-3.0E
---	----------------

Faculty	Pharmacy	Department	Pharmacy
Course number	201741	Course title	Advanced Pharmaceutical Analysis
Number of credit hours	3	Pre-requisite/co-requisite	

### Brief course description:

The course describes the recent pharmaceutical instruments and techniques used in pharmaceutical analysis. Including both separation techniques such as capillary electrophoresis chromatography. And spectroscopic techniques such as UV-Vis, Atomic, IR, NMR and Mass spectroscopies.

Course goals and learning outcomes	
<b>Goal 1</b>	<b>Deepening the students' understanding of the concepts of pharmaceutical analysis and their techniques.</b>
Learning outcomes	<p><b>1.1</b> The students should acquire the basic and advanced knowledge regarding the <b>importance</b> of instrumental analysis in pharmaceutical research, industry and regulation and their principles.</p> <p><b>1.2</b> The students should possess basic and <b>advanced</b> skills in terms of pharmaceutical analysis techniques utilized in scientific research, control authorities, pharmaceutical companies and pharmaceutical research centers.</p>
<b>Goal 2</b>	<b>Designing, developing, exploiting and criticizing pharmaceutical analytical methods, used in pharmaceutical research, industries and drug discovery.</b>
Learning outcomes	<b>2.1</b> The students should gain the ability to employ the knowledge acquired through the course to <b>design, develop</b> and <b>criticize</b> pharmaceutical analytical methods based on their principles.
<b>Goal 3</b>	<b>Identifying the applications of pharmaceutical analytical instrumentations in different pharmaceutical fields.</b>
Learning outcomes	<b>3.1</b> The students should acquire the ability to utilize his/her understanding to choose the best suited pharmaceutical technique for the required <b>application</b> in pharmaceutical research centers, manufacturers, industries and regulatory bodies.
<b>Textbook</b>	<p><b>1.</b> Pharmaceutical Analysis: <i>A Textbook for Pharmacy Students and Pharmaceutical Chemists</i>, 3rd edition, David Watson, Elsevier/ Churchill Livingstone, 2012.</p> <p><b>2.</b> Skoog, D. A. 2014. <i>Principles of Instrumental Analysis</i>, 9th edition. Brooks/ Cole Thomson Learning, Australia.</p>
<b>Supplementary references</b>	<p><b>1.</b> Landers, J.P. ed., 2007. <i>Handbook of capillary and microchip electrophoresis and associated microtechniques</i>. CRC press. Organic Structures from Spectra, 3<sup>rd</sup> edition, L. D. Field, S. Sternhell and J. R. Kalman, John Wiley &amp; Sons.</p> <p><b>2.</b> <i>Spectrometric Identification of Organic Compounds</i>, 7<sup>th</sup> edition, Robert M. Silverstein, Francis X. Webster and David Kiemle, John Wiley &amp; Sons, 2005.</p> <p><b>3.</b> <i>Principles of Instrumental Analysis</i>, 6<sup>th</sup> edition, Skoog, D. A., Brooks/ Cole Thomson Learning, 2007.</p>

### Course timeline



الجامعة الزيتونة الأردنية  
Faculty of Pharmacy  
Al-Zaytoonah University of Jordan  
" نحو تعليم صيدلاني متميز "

Toward Excellence in Pharmaceutical  
Education

الجامعة الزيتونة الأردنية  
Al-Zaytoonah University of Jordan  
كلية الصيدلة  
Faculty of Pharmacy



"Tradition and Quality"

Detailed Course Description - Course Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-3.0E
---	----------------

Week	Number of hours	Course topics	Pages (textbook)	Notes
1.	3	<ul style="list-style-type: none"> <li>- <b>Introduction:</b> <ul style="list-style-type: none"> <li>) Importance of pharmaceutical instrumental analysis</li> <li>) The concept of pharmaceutical analysis in pharmaceutical research and industry and pharmacopoeial specifications of a pharmaceutical product.</li> <li>) Criteria of reliable analytical methods.</li> <li>) Analytical methods review and validation.</li> <li>) Basics of instruments in instrumental analysis.</li> <li>) Types of Error in experimental data.</li> </ul> </li> </ul>	1  5 7  2	
2.	3	<ul style="list-style-type: none"> <li>- <b>Chromatographic Techniques:</b> <ul style="list-style-type: none"> <li>) Theory of chromatography.</li> <li>) Basic concept of chromatogram.</li> <li>) Parameters of chromatography. e.g. retention time, peak width, resolution etc</li> </ul> </li> </ul>	252 253 258	
3.	3	<ul style="list-style-type: none"> <li>- <b>Chromatographic Techniques:</b> <ul style="list-style-type: none"> <li>) Instrumentation of HPLC, modes of HPLC: normal phase and reversed phase.</li> <li>) Factors affecting retention on either mode.</li> <li>) Gas chromatography.</li> <li>) Analytical applications of HPLC.</li> <li>) Analytical applications of GC.</li> <li>) Analytical applications of recent advances in chromatography.</li> </ul> </li> </ul>	253  258  265 263 284 298	
4.	3	<ul style="list-style-type: none"> <li>- <b>Capillary electrophoresis:</b> <ul style="list-style-type: none"> <li>) Theory of electrophoresis.</li> <li>) CE instrumentation, EOF and migration times.</li> <li>) Electropherogram.</li> <li>) Applications of CE in pharmaceutical analysis</li> </ul> </li> </ul>	377 380  383 384	
5.	3	<ul style="list-style-type: none"> <li>- <b>UV-Vis spectroscopy:</b> <ul style="list-style-type: none"> <li>) Basic concepts of light (spectrum and electromagnetic radiation) and interaction with matter, theory of excitation and structural requirements for light absorption.</li> </ul> </li> </ul>	91	



الجامعة الزيتونة الأردنية  
Faculty of Pharmacy  
Al-Zaytoonah University of Jordan  
" نحو تعليم صيدلاني متميز "

Toward Excellence in Pharmaceutical  
Education

الجامعة الزيتونة الأردنية  
Al-Zaytoonah University of Jordan  
كلية الصيدلة  
Faculty of Pharmacy



"Tradition and Quality"

Detailed Course Description - Course Plan Development and Updating Procedures/ Pharmacy Department		QF02/0408-3.0E
---	--	----------------

		<ul style="list-style-type: none"> <li>) Basic design of UV/ Vis. Spectroscopy.</li> </ul>	95	
		<ul style="list-style-type: none"> <li>) Beer's Lambert law.</li> </ul>	94	
		<ul style="list-style-type: none"> <li>) Applications of UV/visible spectroscopy to pharmaceutical quantitative analysis</li> </ul>	103	
6.	3	<ul style="list-style-type: none"> <li>- <b>Molecular Emission Spectroscopy:</b> <ul style="list-style-type: none"> <li>) Fluorescence and phosphorescence origin, excited and ground state.</li> <li>) Effect of structure, temperature and solvent.</li> <li>) Basic design of a spectrofluorometer and applications.</li> </ul> </li> </ul>	152 155 154	
		<ul style="list-style-type: none"> <li>❖ <b>First exam.</b></li> </ul>		
7.	3	<ul style="list-style-type: none"> <li>- <b>Atomic Emission and Atomic Absorption Spectroscopy:</b> <ul style="list-style-type: none"> <li>) Basic theory of atomic excitation.</li> <li>) Analytical applications.</li> <li>) Instrumentation, advantages and disadvantages of each technique.</li> </ul> </li> </ul>	138 140-150	
8.	3	<ul style="list-style-type: none"> <li>- <b>Infra-Red Spectroscopy (IR):</b> <ul style="list-style-type: none"> <li>) Origin of IR band, modes of vibrations.</li> <li>) Uses of IR for identification and elucidation of compounds.</li> <li>) Basic designs of the instrument</li> <li>) Practical handling of the sample.</li> </ul> </li> </ul>	115 123 118 120	
9.	3	<ul style="list-style-type: none"> <li>- <b>NMR Spectroscopy:</b> <ul style="list-style-type: none"> <li>) The origin of resonance, spin- spin coupling.</li> <li>) The concept of chemical shift.</li> <li>) <sup>1</sup>H NMR.</li> </ul> </li> </ul>	166 168 168	
10.	1 1 1	<ul style="list-style-type: none"> <li>- <b>NMR Spectroscopy:</b> <ul style="list-style-type: none"> <li>) <sup>13</sup>C NMR</li> <li>) Two-dimensional NMR spectra.</li> <li>) Applications and examples.</li> </ul> </li> </ul>	192 194 199	
		<ul style="list-style-type: none"> <li>❖ <b>Second exam</b></li> </ul>		
11.	3	<ul style="list-style-type: none"> <li>- <b>Combined structure problems:</b> <ul style="list-style-type: none"> <li>) UV spec.</li> <li>) IR spec.</li> <li>) Mass spec.</li> <li>) <sup>1</sup>H and <sup>13</sup>C NMR</li> </ul> </li> </ul>	Structure Elucidation	
12.	3	<ul style="list-style-type: none"> <li>- <b>Structure Elucidation Examples:</b> <ul style="list-style-type: none"> <li>) Example #1</li> </ul> </li> </ul>	Problems	



الجامعة الزيتونة الأردنية  
Faculty of Pharmacy  
Al-Zaytoonah University of Jordan  
" نحو تعليم صيدلاني متميز "

Toward Excellence in Pharmaceutical  
Education

الجامعة الزيتونة الأردنية  
Al-Zaytoonah University of Jordan  
كلية الصيدلة  
Faculty of Pharmacy



"Tradition and Quality"

<b>Detailed Course Description - Course Plan Development and Updating Procedures/ Pharmacy Department</b>	<b>QF02/0408-3.0E</b>
---	-----------------------

		<ul style="list-style-type: none"> <li>) Example #2</li> <li>) Example #3</li> </ul>	and examples	
<b>13.</b>	3	<ul style="list-style-type: none"> <li>- <b>Article discussion no. 1:</b> <ul style="list-style-type: none"> <li>) Objectives</li> <li>) Method development</li> <li>) Discussion</li> <li>) Findings</li> </ul> </li> </ul>	Paper reviewing	
<b>14.</b>	3	<ul style="list-style-type: none"> <li>- <b>Article discussion no. 2:</b> <ul style="list-style-type: none"> <li>) Objectives</li> <li>) Method development</li> <li>) Discussion</li> <li>) Findings</li> </ul> </li> </ul>	Paper reviewing	
<b>15.</b>	3	<ul style="list-style-type: none"> <li>- <b>Article discussion no. 3:</b> <ul style="list-style-type: none"> <li>) Objectives</li> <li>) Method development</li> <li>) Discussion</li> <li>) Findings</li> </ul> </li> </ul>	Paper reviewing	
<b>16.</b>	3	<ul style="list-style-type: none"> <li>- <b>Article discussion no. 4:</b> <ul style="list-style-type: none"> <li>) Objectives</li> <li>) Method development</li> <li>) Discussion</li> <li>) Findings</li> </ul> </li> <li>❖ <b>Final exam</b></li> </ul>	Paper reviewing	

<b>Theoretical course evaluation methods and weight</b>	Participation = 10% First exam 20% Second exam 20% Final exam 50%	<b>Practical (clinical) course evaluation methods</b>	
---	--	---	--

<b>Approved by head of department</b>		<b>Date of approval</b>	
---------------------------------------	--	-------------------------	--

Extra information (to be updated every semester by corresponding faculty member)

<b>Name of teacher</b>	<b>Dr. Ala A. Alhusban</b>	<b>Office Number</b>	<b>406</b>
<b>Phone number (extension)</b>	454	<b>Email</b>	<a href="mailto:Ala.Alhusban@zuj.edu.jo">Ala.Alhusban@zuj.edu.jo</a>
<b>Office hours</b>	Announced at office door.		